



EXP-12

June 11, 1972

ACCELERATOR EXPERIMENT--Main-Ring High-Field Momentum Aperture

Experimentalists: S. Mori, R. Stiening, *et.al.*

Date Performed: June 11, 1972

Measurement and Analysis:

The momentum aperture at ~200 GeV was measured by moving the beam radially inward and outward using rf. The bias signal on the rf radial-position sensor is a sine wave with a half period of ~60 msec. Previous measurement made with a radial bias turned on abruptly (faster than the phase oscillation period) is invalid. It is understandable that it is o.k. to bump the beam inward (requiring the beam to receive less acceleration) abruptly but to bump the beam outward (requiring the beam to receive more acceleration) too abruptly will lose the beam.

The inner and outer limits at the rf radial-position sensor (E42, $x_p = 5.13 \text{ m} \sim x_{p \text{ max}}$) are

	<u>radial excursion</u>	<u>$\Delta p/p$</u>
inner	-2.9 cm	-0.57%
outer	2.4 cm	0.47%

The total radial excursion of 5.3 cm should be compared to the expected maximum of 6.5 cm. (See EXP-11, except the radial beam size and momentum spread assumed there may be too large. The expected maximum may be as large as 7.5 cm corresponding to

$\frac{\Delta p}{p} = \pm 0.73\%$.) In any case, this measured momentum aperture is not too far away from the expected maximum.

In addition, the limiting outward excursions were measured at locations F32 to F48. The limiting inward excursions were not measured. Those given in the table below are the limiting inward excursions measured on May 20, 1972 at ~80 GeV. If the orbit does not change significantly between 80 GeV and 200 GeV, we may combine these data.

Radial Excursion					
	Outer Limit(cm)	Inner Limit(cm)	Total (cm)	x_p (m)	$\Delta p/p(\%)$
F32	0.79	-2.70	3.49	4.24	0.82
F34	1.59	-1.59	3.18	2.53	1.26
F36	0.95	-2.86	3.81	2.32	1.64
F38	2.54	-2.86	5.40	3.90	1.38
F42	2.06	-3.02	5.08	5.13	0.99
F44	1.11	-2.70	3.81	4.37	0.87
F46	0.95	-0.95	1.90	2.63	0.72
F48	0.95	-1.11	2.06	2.28	0.90

The last column giving the full momentum aperture is consistent with the value of $\frac{\Delta p}{p} = (0.47 + 0.57)\% = 1.04\%$ at E42. But the fact that these numbers vary by almost a factor of 2 indicate that it is improper to combine the May 20 data with those from this experiment.

This experiment should be repeated more carefully to include both the outer and the inner limits.

L. C. Teng